Screening for Beryllium in Low-Risk Laboratory Facilities

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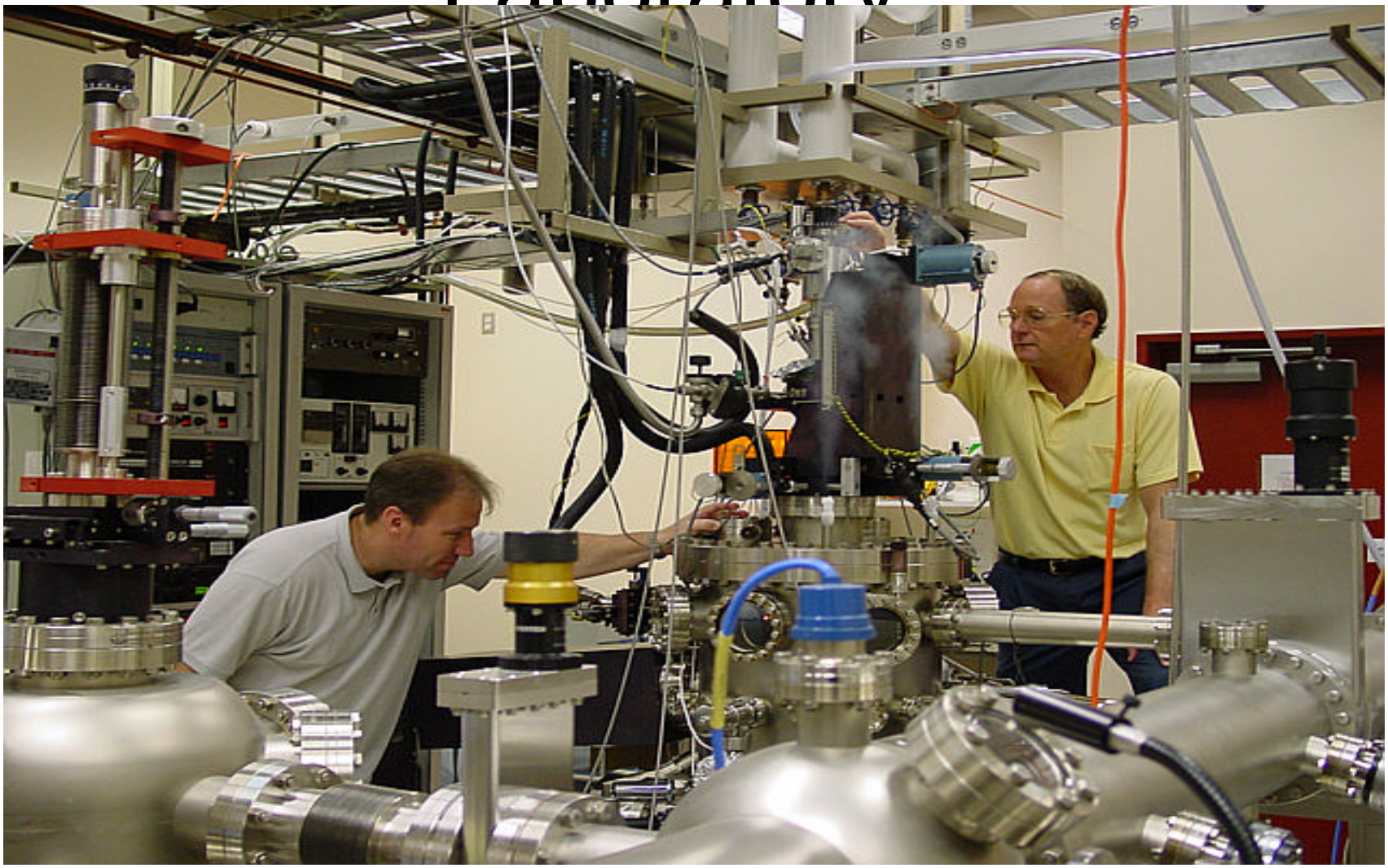
Overview of Presentation

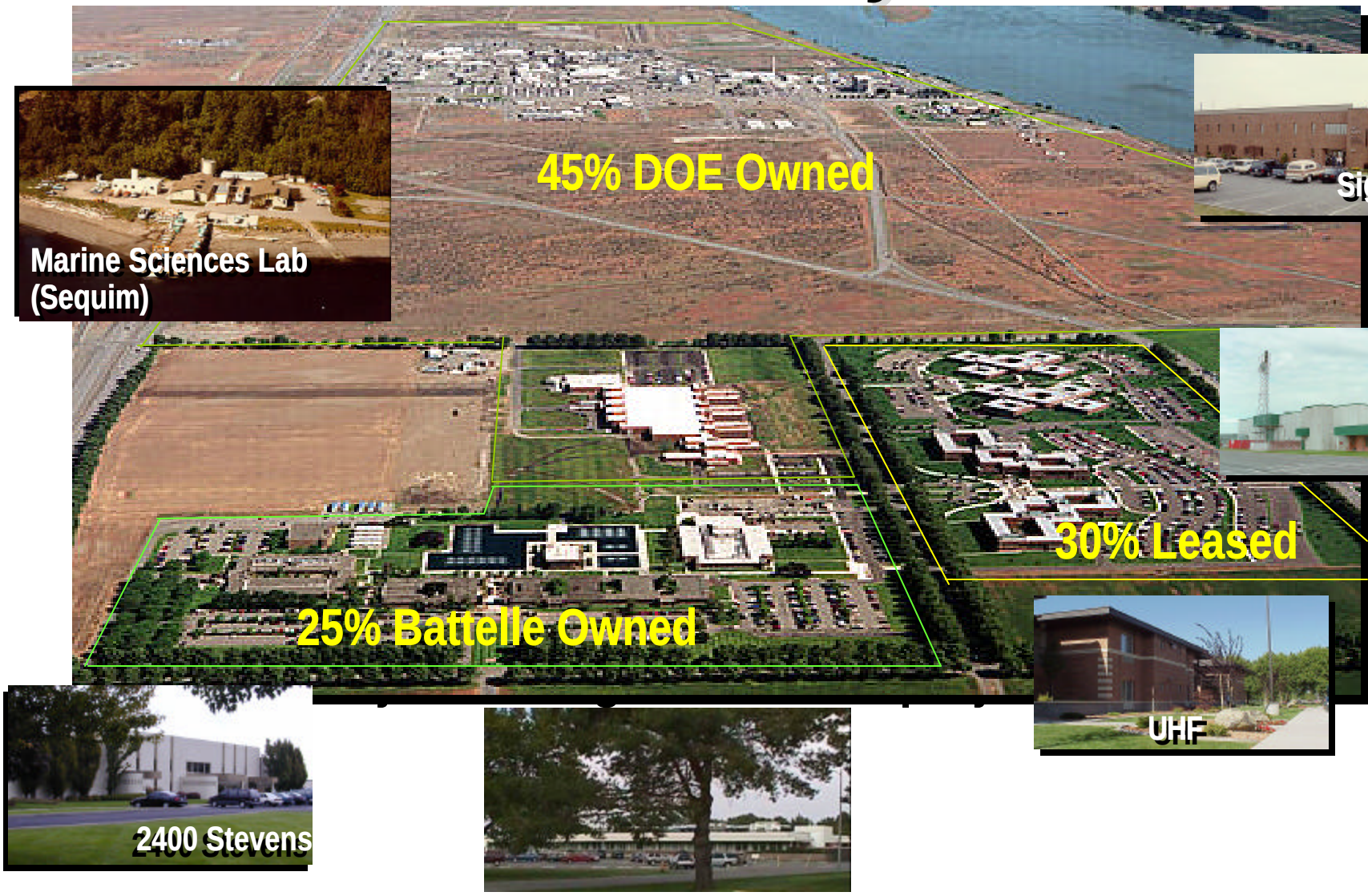
- Beryllium use at PNNL: past and present
- PNNLs beryllium program: how and why it’s evolved
- Our facility screening program for low-risk laboratory facilities
- Low-risk = minimal or no historical use in a particular laboratory, but use nearby or in same building

PNNL – Eastern Washington

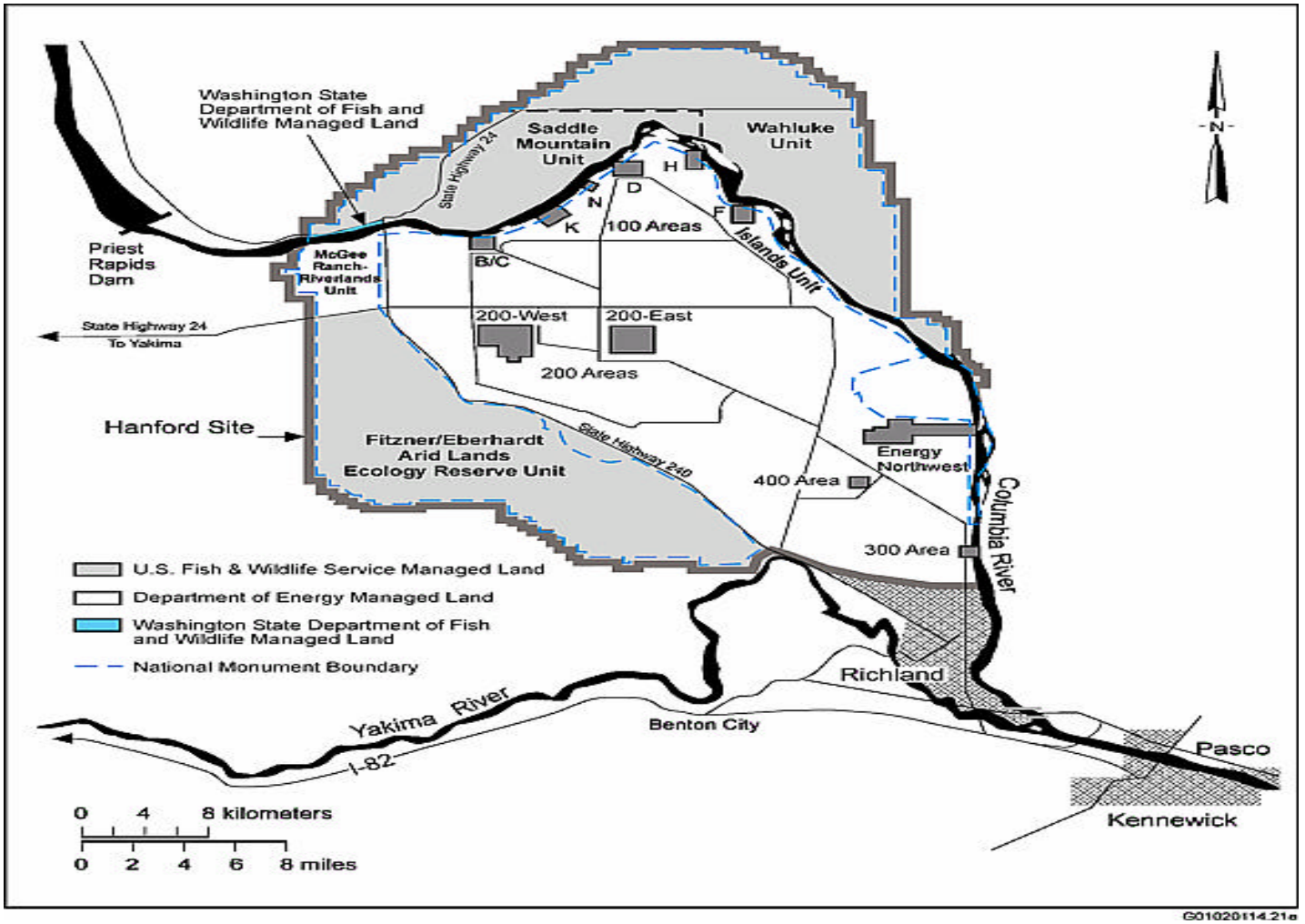
PNNL – Multiprogram National Laboratory



PNNL Laboratory Facilities



PNNL and Hanford Site History



Where was/is Beryllium at PNNL?

- Historical Laboratory Operations:
  Metallurgy
  Nuclear fuels research
  Coatings technology
- Primarily metallic beryllium and alloys
  Some beryllium oxide
- Currently very limited lab operations with Be
- Use of beryllium components: XRD windows, pressure cells, electrical components, tools, etc.

Initial 2000 Beryllium Inventory

- History
- Scoping surveys in 18 buildings
- Didn’t do wall-to-wall, ceiling-to-floor surveys in all buildings, but used statistical sampling in areas where we had history of Be use.
- In buildings where surveys were done, the whole building was not sampled: lab operations concept
- Decontamination done in 4 buildings as a result of the scoping survey, for results > Public Release Limit but < Housekeeping Limit

Post-2000 Activities

- Managing legacy issues – ductwork; spaces behind walls/ceilings; equipment
- “Pieces and parts” – small areas of low-level beryllium contamination showing up in unexpected areas, or areas downstream or adjacent to places where contamination was known to exist
- We found some ongoing research activities that we didn’t know about
- Dealing with issues around contamination

PNNLs Current Be Program

- **Conservative program**
  - **Control of beryllium at the laboratory room level, not the building level**
  - **Maintain routinely occupied spaces to contamination levels of less than the public release limit**
  - **Prevent spread/ new areas of contamination**
  - **Limitations on type of Be work done**
  - **Monitoring during work that may liberate legacy contamination and upon worker request**
  - **Procedures to prevent Be-contaminated items from being excessed to public**
  - **Worker input and communication important**
  - **We have no regulated areas**

Changes in 2003-2005

- Due to areas of unexpected low-level contamination popping up in our facilities, and in facilities owned by other contractors, we decided to expand our facility characterization
- All occupied buildings in the 300 Area
- All areas of buildings only partially characterized
- Buildings served by/associated with those already known to have contamination: research having multiple locations, maintenance areas serving research facilities, etc.
- Issue of excessing equipment with uncertain

Facility Screening Program: Basis

- Risk of finding beryllium low
- Levels would likely be low, based on prior results
- Thousands of square feet to cover quickly using current funding
- Value/yield of statistical surveys seemed low
- Facilities are non-uniform: different rooms with very different activities within the same building

Facility Screening Methods

- Went through maps to identify locations to be sampled: 1 sample per room or ~150 sq. ft. area
- Used 500 cm^2 wipe samples:
  - Five 100 cm^2 samples collected on one wet GhostWipe
  - Clear documentation of areas where samples taken and appearance of areas – form, pictures, marking areas with tape or Sharpies
  - Biased approach: looking for undisturbed areas, or areas likely to have contamination

Evaluating Screening Samples

- **Established a level at which follow-up would be required: 0.10 ug beryllium per 500 cm^2 sample**
- **Do not average out the sample numbers – use the raw results**
- **Established a margin of safety to assure that we aren't hiding a significant area of contamination on one section of the sample by dividing out**
- **Follow-ups: 100 cm^2 samples, going back to all 5 areas sampled, taking as many samples as necessary to get representative samples, using a combined bias/random approach, plus sampling other adjacent areas.**
- **Follow-up evaluation also includes history from occupants of the space: what's been done in the space, etc.**

Results of Screening to Date

- Total samples taken to date: 1006
- Samples below 0.10 ug total mass: 944 (94%)
- Samples above 0.10 ug total mass: 62 (6%)
- Number of buildings screened : 16
- Number of Buildings with an area requiring at least one follow-up:
  10
- Number of buildings where

Pros and Cons

- Pros:

  Cover space quickly and cheaply

  Allows us to screen areas we might not be able to otherwise, given resource limitations

  Gives us one more set of data points

  Handy technique for small items being excessed
- Cons:

  Lots of data to manage

  Large wipes, biased toward areas that are undisturbed, can be heavily loaded, producing confusion over what's soil

Data Management and Communications

- We use a Access-to-graphical map technique for 100 cm^2 samples (next slide) .
- 500 cm^2 samples are currently managed in Access.
- We're looking for a way to use a graphical map technique without confusing people with two sample sizes.
- Facilities staff have their work order system linked to our database of 100 cm^2,

Conclusions

- We have found that a only small percent of samples/spaces require follow-up.
- This occurs even though we don’t try to discriminate between natural Be in soil, and industrial Be: many of our samples are dirty.
- The same results might not be found if the program were applied in other facilities with different types of operations.
- Program has provided assurance to workers that Be is being managed and we have knowledge of our facilities.
- Program expands our database of beryllium in